# sheet 2

## [1] True or False.

a) user requests a web Page that Consists of some text and three images. for this Page, client will send one request msg. and receive four response messages (False)

b) Two distinct webPages (for ex., www.mit.edu/research.html and www.mit.edu/students.html) Can be sent over same Persistent Conection (True Cause URLs belong to same server)

c) with nonPeresistent Connections between browser and origin server, it is Possible for single TCP segment to carry 2 distinct HTTP request msgs (False)

d) The data: header in the HTTP response message indicates when the object in the response was last modified (False)

e) HTTP response messages never ~~happen~~ have an empty message body (False)

[3] Consider HTTP client that wants to retrieve a web document at given URL. the IP address of HTTP server is initially unknown. What transport and application layer Protocols beside HTTP are needed here?

* DNS Protocol
  - work in UDP transport Protocol.
  - Port 53.

[4] Consider following string of ASCII charcters that captured by wireshark when browser sent HTTP GET msg. ( <cr> → Carriage return. <lf> → line Feed , Answer by using this

GET /cs453/index.html HTTP/1.1<cr><lf> Host: gaia.cs.umass.edu<cr><lf>user-Agent: Mozilla/5.0(windows; U; windows NT 5.1; en-US; rv:1.7.2) Gecko/20040804 Netscape/7.2 (ax) <cr><lf> Accept: ext/xml, application/xml, application/xhtml+xml, text/html; q=0.9, text/plain; q=0.8, image/png, */*; q=0.5<cr><lf> Accept-Language: en-us, en; q=0.5<cr><lf> Accept-Encoding: zip, delfate<cr><lf> Accept-charset: ISO-8859-1, utf-8; q=0.7, *; q=0.7 <cr><lf> Keep-Alive: 300 <cr><lf> Connection:

Keep-alive <cr><lf><cr><lf>

a) what is url of document requested by browser

↳ gaia.cs.umass.edu/cs 45

b) what is version of HTTP is the browser running?

↳ HTTP/1.1

c) Does browser request non-Persistent or Persistent Connection? Persistent ⇒ Connection : Keep alive.

d) what is IP address of host on which browser is running? This is not available data.

e) what type of browser initiat message? why browser type needed in HTTP request message?

↳ Mozilla/5.0

↳ cause developers may develop different version of web site for different browsers.

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7 suppose within your web browser you click on a link to obtain web Page. IP address for associated URL is not cached in your local host, so a DNS lookup is necessary to obtain IP address, suppose that n DNS servers are visited before your host

receives the IP address from DNS, the successive visits incur an RTT, $RTT_1, \ldots RTT_n$ Further suppose that web Page associated with link contains exactly one object, consisting of small amount of HTML text let $RTT_0$ denote RTT between local host and server containing object. Assume zero transmission time of object How much time elapses from when client clicks on link until client receives object?

$$Time = 2\ \underbrace{RTT_0}_{\substack{\text{one for TCP} \\ \text{one for request}}} + \sum_{i=1}^{n} RTT_i$$

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$\boxed{8}$ referring to P7, suppose HTML file refrences eight very small objects on same server. Neglecting transmission time, how much time elapses with.

a) Non-Persistent HTTP with no Parallel TCP connections?

every object requires $2\ RTT_0$

$$Time = 16\ RTT_0 + \sum_{i=1}^{n} RTT_i + \underbrace{2\ RTT_0}_{\text{for index}}$$

b) non-Persistent HTTP with ~~server~~ browser Configured for 5 Parallel Connections?

$$\text{Time} = \underbrace{2RTT_0}_{\text{for 5 objects}} + 2RTT_0 + \sum_{i=1}^{n} RTT_i + \underbrace{2RTT_0}_{\text{basic Html Page}}$$

→ Parallel non-Persistent: TCP initiation and request/response in same time for many objects.

c) Persistent HTTP?

$$\text{Time} = \underbrace{RTT_0}_{\text{TCP}} + \underbrace{8\,RTT_0}_{\text{for 8 objects}} + \sum_{i=1}^{n} RTT_i + \underbrace{RTT_0}_{\text{index}}$$

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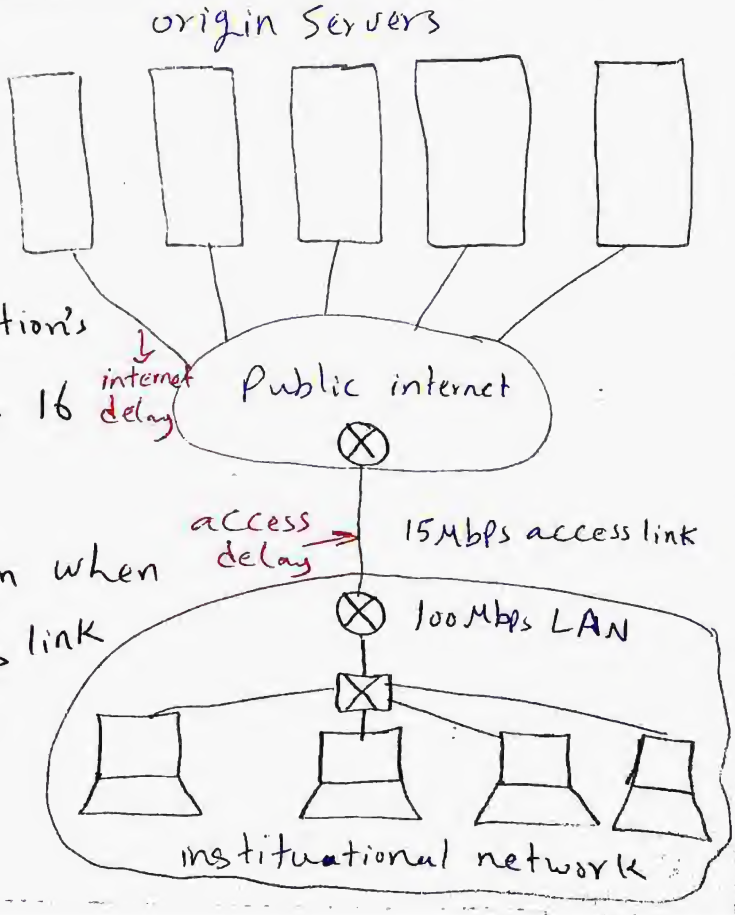


$\boxed{9}$ For this figure suppose that average object size is 850,000 bits and avg. request rate from institution's browsers to originserver is 16 requests per second.

amount of time it takes from when router on internet side of access link forwards HTTP request until it receives response is 3 seconds

Model total average response time as sum of average access delay (delay from internet router to institution router) and average internet delay. For average access delay use $\Delta/(1-\Delta\beta)$ ; $\Delta \rightarrow$ average time required to send an object over access link & $\beta \rightarrow$ arrival rate of objects to access link

a) Find total average response time.

object size = 85000 bits, Avg. request rate = 16 req/sec

Internet delay = 3 sec.

Total response time = internet delay + access delay

$$\text{Avg. Access delay} = \frac{\Delta}{1-\Delta\beta}$$

$\Delta \rightarrow$ time to send data from router 1 to router 2.

$$\Delta = \frac{850000 \text{ bits}}{15 * 10^6 \text{ bits/sec}} = 0.0567 \text{ sec}$$

$\beta \rightarrow$ Avg. response rate = 16 req/sec

$$\text{Avg. Access delay} = \frac{\Delta}{1-\Delta\beta} = 0.6 \text{ sec}$$

Total Avg response time = 3 + 0.6

= 3.6 sec.

b) Suppose a cache is installed in institutional LAN, suppose the miss rate = 0.4, Find total response time

$\beta = 0.4\beta$

Avg. access delay $= \dfrac{\Delta}{1 - 0.4\beta} = 0.089$ sec

Avg. response delay in case of miss $= 3 + 0.089 = 3.089$ sec

Total response time = Hit time + Miss - time

$= 0.6 \times 0 + 0.4 \times 3.089 = 1.24$ second

0.6 chance of hit & 0.4 chance of Hit

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(10) Conside a short, 10-meter link, over which sender Can transmit at rate of 150 bits/sec in both directions Suppose that Packets containing only Control (e.g Ack or handshaking) are 200 bits long. Assume that N Parallel connections each get $\frac{1}{N}$ of link bandwidth. Consider HTTP protocol and suppose each downloaded object is 100 Kbits long & initial downloaded object contains 10 refrenced objects from same sender.

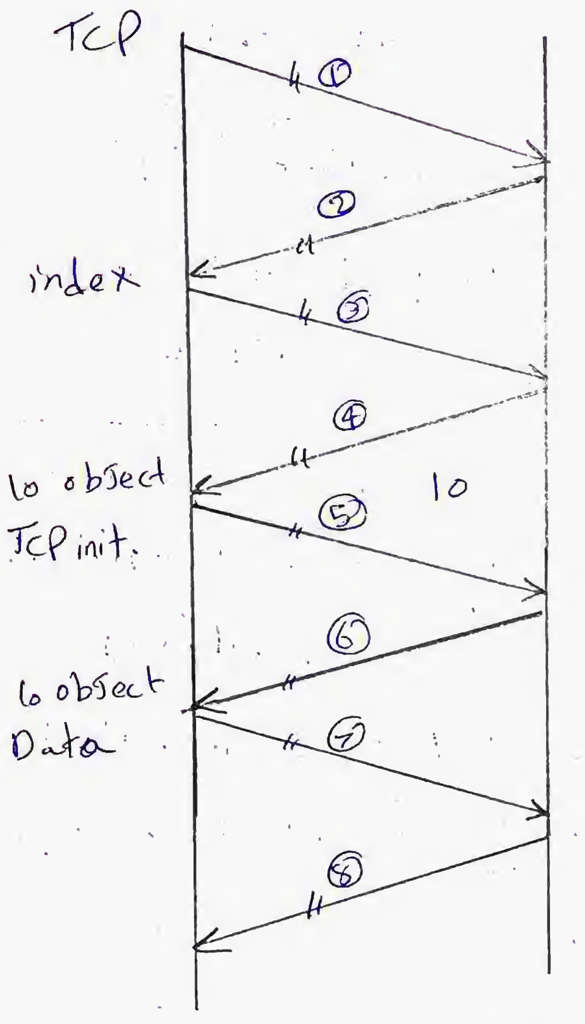
would Parallel downloads via Parallel instances of non-Presistent HTTP make Sense here?

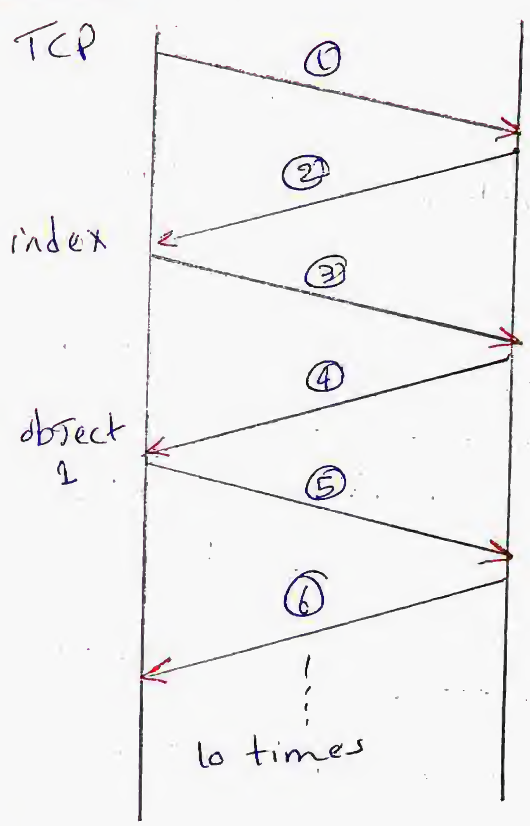
then b) Consider Presistent HTTP? do you expect significant. gains over non-Presistent case? Why?

$R = 150\,bps$, $L_{data} = 100000\,bit$, $L_{control} = 200\,bit$

→ Parallel non Presistent (10 Parallel) | Persistent

$RTT = d_{trans} + \underbrace{d_{prop}}_{\text{neglected}}$




$$\text{delay} = \frac{200}{150} + \frac{200}{150} + \frac{200}{150} + \frac{10^5}{150} + \frac{200}{150/10} + \frac{200}{150/10} + \frac{200}{150/10} + \frac{10^5}{150/10} = 7377 \text{ second}$$

$$\text{Time delay} = \frac{200}{150} + \frac{200}{150} + \frac{200}{150} + \frac{10^5}{150} + \left[\frac{200}{150} + \frac{10^5}{150}\right] * 10$$

$$= 7351 \text{ sec.}$$

(22) Consider distributing file of $F = 15$ Gbits to $N$ peers, server has upload rate of $u_s = 30$ Mbps and each peer has a download rate of $d_i = 2$ Mbps and an upload rate of $u$. For $N = 10, 100$ and $1000$ and $u = 300$ Kbps, 700 Kbps and 2 Mbps prepare chart giving the minimum distribution time of each of combinations of $N$ and $u$ for both client-server distribution and P2P distribution.

Sol

1) client-server

$$\text{Distribution} = \max\left\{\frac{NF}{u_s}, \frac{F}{d_{min}}\right\}$$

$u_s \rightarrow$ server upload rate

$d_{min} \rightarrow$ client download rate

2) Peer to Peer (P2P)

$$\text{Distribution} = \max\left\{\frac{F}{u_s}, \frac{F}{d_{min}}, \frac{NF}{u_s + \sum_{i=1}^{n} u_i}\right\}$$

$u_s + \sum_{i=1}^{n} u_i \Rightarrow$ server and all clients upload rate.